

WE CLAIM:

1. A method of monitoring an earthquake comprising:
 - a) detecting an electromagnetic signal using at least one satellite;
 - b) using said electromagnetic signal detected by said satellites to locate an
5 area on earth from which the electromagnetic signal was generated;
 - c) using at least one ground detector to verify the existence of said
electromagnetic signal; and
 - d) using said ground detectors to precisely locate said electromagnetic signal.
2. The method of claim 1 wherein said satellite is capable of detecting an electromagnetic
10 signal from 0.05 Hz-150 Hz.
3. The method of claim 1 wherein said satellite uses a three-axis antenna.
4. The method of claim 1 wherein said ground detectors are capable of detecting an
electromagnetic signal from 0.05 Hz to 4.5 Hz.
5. The method of claim 1 further comprising the step of:
 - e) relaying RMS data to a control center using said ground detectors.
6. The method of claim 5 further comprising the step of:
 - f) forecasting the occurrence of an earthquake given the data received in steps (a)
15 through (e) over a period of time, typically 1-2 weeks prior to a large earthquake.
7. A satellite and ground system of monitoring an earthquake, comprising:
 - a) at least one satellite comprising:
 - i) a 3-axis search coil magnetometer;
 - ii) data storage that can store the ELF data signals, along with the time the
20 signal was detected and the location of said satellite when said ELF
data signal is detected; and
 - iii) a transmitter to transmit said data through a cooperating ground station
25 to a control center after said satellite collects said ELF signal;
 - b) one or more portable ground detectors comprising:

- i) a 3-axis search coil magnetometer
- ii) data storage that can store raw ELF data, location of ground detector and time said ELF data was received; and
- iii) a transmitter to send said ELF data to said control center;

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c) A control center comprising:

- i) a network connection to the internet or other network to allow the uploading and downloading of earthquake related data
- ii) one or computers to process said earthquake related data.

8. The system of claim 7 wherein said axes of said 3-axis search coil magnetometers are normal to each other.

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9. The system of claim 7 wherein said transmitter of said satellites transmit said data through a cooperating ground station to a control center within 2 revolutions (200 minutes) of the satellite collecting said ELF data signal;

10. The system of claim 7 wherein said 3-axis search coil magnetometers in the satellites have a sensitivity of at least 10 pico Tesla per root Hertz over a bandwidth of 150 Hz.

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11. The system of claim 7 wherein said 3-axis search coil magnetometers in the ground detectors have a sensitivity of at least 10 pico Tesla per root Hertz over a bandwidth of 4.5 Hz.

12. The system of claim 7 wherein said data storage in the ground detectors is removable.

20 13. The system of claim 7 wherein said data storage in the ground detectors contain root mean squared summary data.

14. The system of claim 7 wherein said ground detectors further comprise an automatic signal centering circuit.

25 15. The system of claim 7 wherein said ground detectors further comprise a calibrator circuit that injects a 1 Hz known magnetic field into each antenna of said 3-axis search coil magnetometer.

16. The system of claim 7 wherein said ground detectors further comprise a power relay to apply power to the calibration signal generator only during the calibration sequence.
17. The system of claim 7 wherein said ground detectors further comprise copper foil shielding for all 3-axis search coil antennas.
- 5 18. The system of claim 7 wherein said satellites further comprise copper foil shielding for all 3-axis search coil antennas.
19. The system of claim 7 wherein said satellites further comprise a boom structure, 2-4 meters long.
20. The system of claim 7 wherein said satellites further comprise an electron density instrument on the satellite bus.
- 10 21. The system of claim 7 wherein said satellites further comprise a fourth antenna.
22. The system of claim 21 wherein said fourth antenna is capable of detecting an electromagnetic signal from 0.05 Hz to 5.0 Hz.
23. The system of claim 7 wherein an amplifier and filtering stage of said ground detectors comprises:
 - 15 a) a preamp having an output;
 - b) an amplifier filter circuit having an output with it's input coupled to said preamp;
 - c) 3 low pass filters having an output with it's input coupled to said amplifier filter circuit;
 - 20 d) a DC blocking capacitor having an output with it's input coupled to said 3 low pass filters;
 - e) an amplifier having an output with it's input coupled to said DC blocking capacitor; and
 - 25 f) a variable amplifier having an output with it's input coupled to said amplifier.

24 The system of claim 23 wherein said amplifier filter circuit further comprises: a 1000 microfarad capacitor in series between at least one low pass filter and two stages of amplification.

25 A method of processing earthquake data comprising:

- a) downloading ELF data in a particular region from a satellite;
- b) comparing said ELF data to a threshold value in a database;
- c) checking a database for solar flare activity;
- d) calculating a reverse propagation path of said ELF data;
- e) comparing said ELF data with historical earthquake data in said region;
- f) waiting for said satellite to make another orbit, and reverify said ELF data and;
- g) placing ground monitors in locations around origin of said ELF data to determine a centroid of ELF activity.

26 The method of claim 25 where in said database is accessed through the NOAA website.

27 A method of locating an ELF signal comprising:

- a) calculating an estimated centerpoint of an ELF signal based on data received from a satellite;
- b) deploying a ground monitor at said centerpoint;
- c) deploying one or more ground monitors on the fault line near the centerpoint;
- d) determining which ground monitor has the highest rms data output;
- e) moving all other monitors except that determined in step d) in a cross-track orientation to the fault line to determine if the source is on the main fault trace or a splinter fault in close proximity;
- f) repeat steps d) and e) as necessary to locate the signal to a determined threshold distance.